



Image Credit: Pixabay/tpsdave

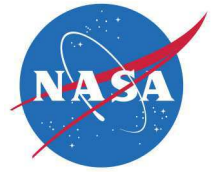
Sensors

Nonlinear Ultrasonic Scanning System

[For detecting material defects](#)

NASA Langley Research Center has developed a method and system for detecting defects in a material by mixing waves of known frequencies at an interaction zone in the material. This method and system provides a defect detection capability that will allow structures to be repaired or taken out of service before cracks can develop. A structure can be scanned in situ and need not be under stress for accurate measurement. The invention is well-suited to be used as part of a preventive maintenance program for a variety of material, vehicle and/or structural applications.

National Aeronautics and
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BENEFITS

- ➡ Fatigue can be detected at an earlier stage
- ➡ In situ scanning
- ➡ Highly accurate

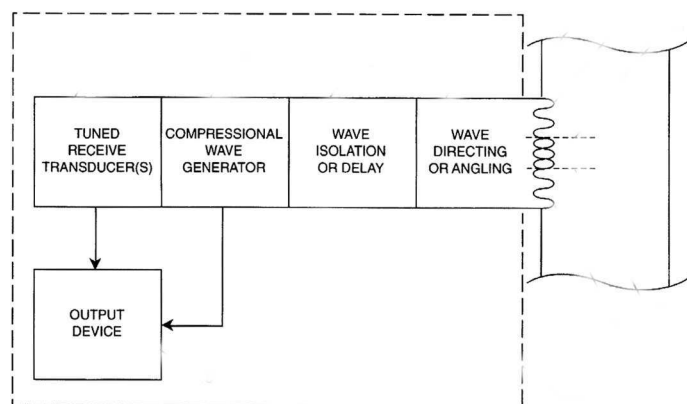
technology solution

NASA Technology Transfer Program

Bringing NASA Technology Down to Earth

THE TECHNOLOGY

The NASA method and system for detects defects in a material by mixing waves of known frequencies at an interaction zone in the material. As a result, at least one of a difference wave and a sum wave are generated in the interaction zone. The difference wave occurs at a difference frequency and the sum wave occurs at a sum frequency. The amplitude of at least one nonlinear signal based on the sum and/or difference waves is then measured. The nonlinear signal is defined as the amplitude of one of the difference wave and sum wave relative to the product of the amplitude of the surface waves. The amplitude of the nonlinear signal is an indication of defects (e.g., dislocation dipole density) in the interaction zone.



A block diagram of an embodiment of a scanning system for detecting the early stages of fatigue or other service life induced defects in a material or structure.

APPLICATIONS

The technology has several potential applications:

- ➡ Aerospace vehicle inspections
- ➡ Civil structures: e.g. bridges

PUBLICATIONS

Patent No: 5,736,642



National Aeronautics and Space Administration

The Technology Gateway

Langley Research Center

Mail Stop 151
Hampton, VA 23681
757.864.1178

LARC-DL-technologygateway@mail.nasa.gov

<http://technology.nasa.gov/>

www.nasa.gov

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NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

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